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ELECTRICAL ENGINEERING RESEARCH LABORATORY
THE UNIVERSITY OF TEXAS
Austin, Texas

QUARTERLY ENGINEERING REPORT NO. 4

Research on Electromagnetic Wave Propagation Effects
in Dynamic Situations

1 February 1963 - 30 April 1963

Contract AF 33(657)-8716
Project 4062

Aeronautical Systems Division
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio

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I. INTRODUCTION

This is the fourth Quarterly Engineering Report of research activities at The University of Texas sponsored by the Aeronautical Systems Division, Air Force Systems Command, under Contract AF 33(657)-8716.

Measurement in the laboratory's 500-foot absorption cell of the intensity and shape of the 118.75 kMc/s oxygen line at gas pressures between 0.5 and 760 mm of Hg and frequencies ± 0.4 kMc/s of the line center frequency have been completed. The line center attenuation and line half intensity-half width are approximately 1.4 db per km and 2 Mc/s per mm of Hg, respectively, for atmospheric oxygen at a temperature of 300°K and pressures where collisional broadening predominates.

II. INSTRUMENTATION AND MEASURING TECHNIQUE

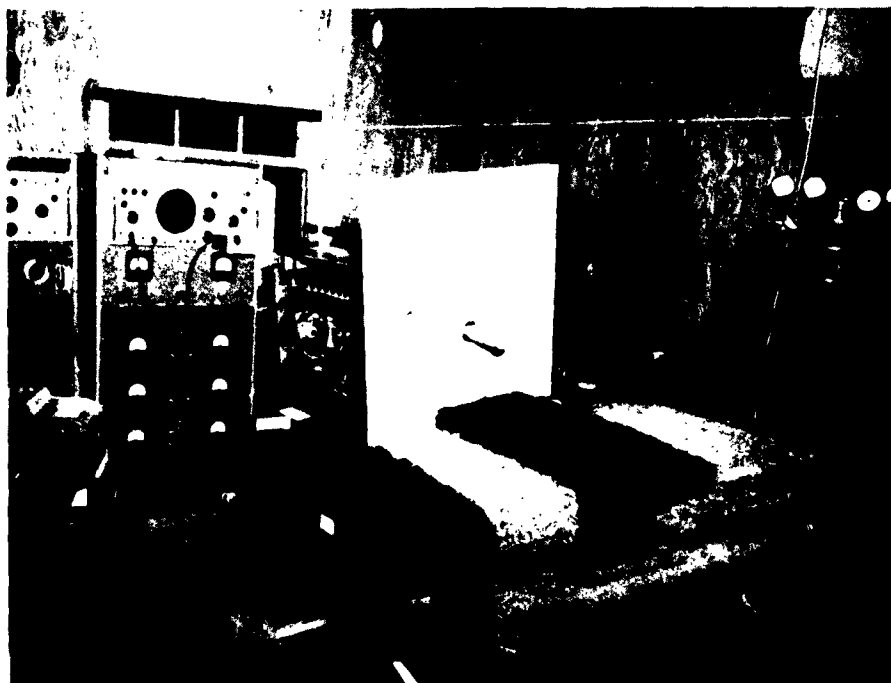
The attenuation as a function of frequency was measured by observing the change in attenuation through a 6-inch diameter, 500-foot long cell for various pure oxygen molecular densities in the cell.

A signal derived from an FXR crystal harmonic generator excited by a Raytheon type QKK864 klystron and propagated through the cell was detected by a receiver utilizing crystal harmonic mixing techniques. The output of the receiver was displayed on an oscilloscope and a pen and ink

recorder. A photograph of the transmitter and receiver are shown in Fig. 1. The local oscillator of the receiver was frequency modulated at approximately 2000 c/s to assure heterodyning of the transmitted signal at the i. f. frequency of 30 Mc/s.

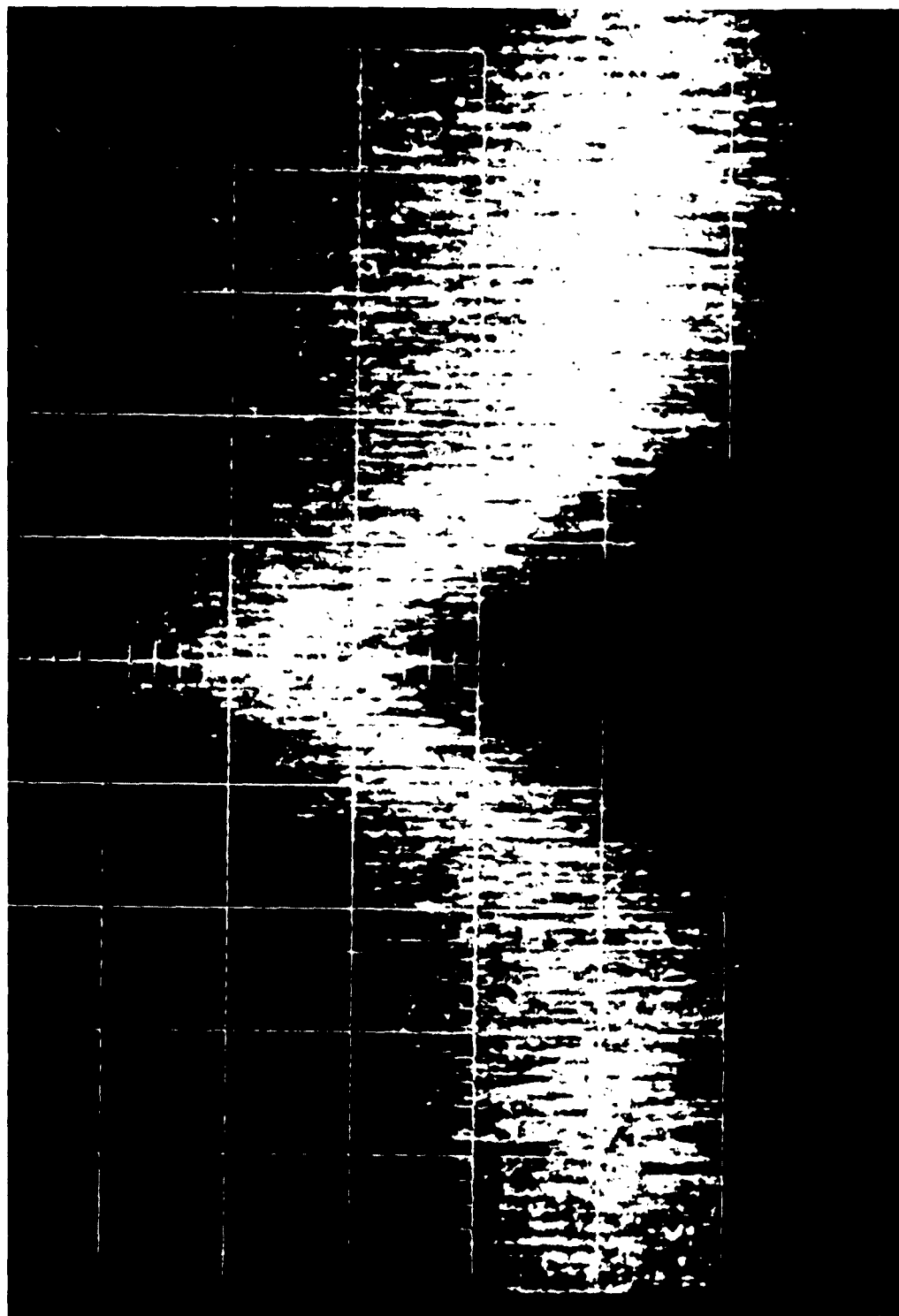
At low gas pressures of approximately 0.5 to 5 mm of Hg, the absorption of the line versus frequency was displayed by frequency modulating the transmitted signal over the interval of significant absorption of the oxygen line. Such a display photograph on the screen of the oscilloscope is shown in Fig. 2. At high gas pressure where the significant absorption of the line could not be displayed by frequency modulating the transmitter because of the i. f. image measurements of attenuation versus gas pressure were made at fixed transmitter frequencies.

An Electrical Engineering Research Laboratory report describing the investigation of the 118.75 kMc/s oxygen line is being prepared and will be issued under this contract.



ABSORPTION CELL TRANSMITTER AND RECEIVER

FIG 1



ABSORPTION OF 118.75 km/s OXYGEN LINE VERSUS FREQUENCY

FIG. 2.

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